Mimicking amphoteric refraction in photonic crystals

Alejandro Martínez and Javier Martí,
Valencia Nanophotonics Technology Center, Universidad Politécnica de Valencia
Campus del Camino de Vera, 46022 Valencia (Spain)

Recently, it was reported that at the interface between an isotropic medium and a uniaxial crystal (or between two uniaxial crystals) a phenomenon known as amphoteric refraction, this is, positive as well as negative refraction, can take place. We show that from an analysis of the equifrequency surfaces and properly choosing the interface, a two dimensional photonic crystal can also present amphoteric refraction, as depicted in Fig. 1. However, total transmission is difficult to achieve because a Bloch mode is excited inside the photonic crystal and the coupling efficiency from this mode to an external plane wave is less than unity.

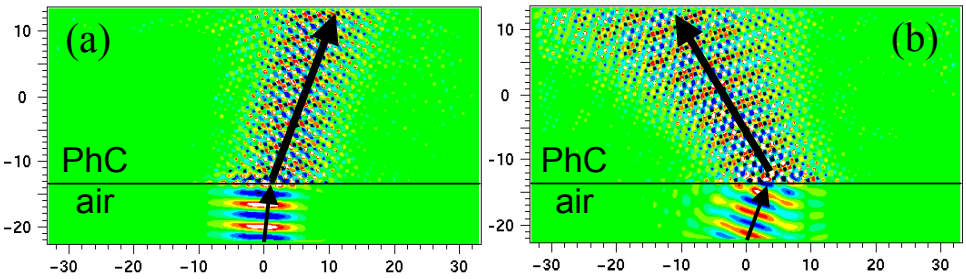

Figure 1: amphoteric refraction at the air-PhC Interface: (a) positive, (b) negative refraction.